

CLAIMS

What is claimed is:

1. A method for insitu plasma bonding of wafers, comprising the steps of:

(a) for silicon dioxide, silicon, silicon nitride or other materials where an

5 insulating interface is desired,

(i) cleaning the wafers,

(ii) rinsing and drying the cleaned wafers,

(iii) placing the wafers into a plasma chamber equipped with a bonding
apparatus,

10 (iv) exposing the wafers to a plasma which reduces the surface species
of the candidate material, and

(v) without breaking vacuum, placing the wafer surfaces together and
into contact; and

(b) for silicon, gallium arsenide, indium phosphide, or other materials where a
15 direct contact without an interface is desired,

(i) for silicon, cleaning the wafers,

(ii) optionally rinsing and drying the cleaned wafers,

(iii) placing the wafers into a plasma chamber equipped with a bonding
apparatus,

20 (iv) exposing the wafers to a plasma which reduces the surface species
of the candidate material, and

(v) without breaking vacuum, placing the wafer surfaces together and

into contact.

2. A method as recited in claim 1, wherein said plasma is selected from the group consisting of hydrogen, oxygen, argon with hydrogen, NH_4 , and H/He.

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3. A method for insitu plasma bonding of wafers, comprising the steps of:

(a) for silicon dioxide, silicon, silicon nitride or other materials where an insulating interface is desired,

(i) cleaning the wafers,

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(ii) rinsing and drying the cleaned wafers,

(iii) placing the wafers into a plasma chamber equipped with a bonding apparatus,

(iv) exposing the wafers to an oxygen plasma and reducing the surface species of the candidate material, and

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(v) without breaking vacuum, placing the wafer surfaces together and into contact; and

(b) for silicon, gallium arsenide, indium phosphide, or other materials where a direct contact without an interface is desired,

(i) for silicon, cleaning the wafers,

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(ii) optionally rinsing and drying the cleaned wafers,

(iii) placing the wafers into a plasma chamber equipped with a bonding apparatus,

(iv) exposing the wafers to an plasma selected from the group consisting of hydrogen, argon with hydrogen, NH_4 , and H/He, and

(v) without breaking vacuum, placing the wafer surfaces together and into contact.

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4. A method for insitu plasma bonding of wafers, comprising the steps of:

(a) for silicon dioxide, silicon, silicon nitride or other materials where an insulating interface is desired,

(i) RCA cleaning the wafers omitting the HF dip for oxide surfaces;

10 (ii) rinsing and drying the cleaned wafers,

(iii) placing the wafers into a plasma chamber equipped with a bonding apparatus,

(iv) exposing the wafers to 100 Watt RF oxygen plasma for at least 5 seconds, and

15 (v) without breaking vacuum, placing the wafer surfaces together and into contact; and

(b) for silicon, gallium arsenide, indium phosphide, or other materials where a direct contact without an interface is desired,

20 (i) for silicon, RCA cleaning the wafers utilizing a HF dip or using another conventional state of the art cleaning method,

(ii) optionally rinsing and drying the wafers,

(iii) placing the wafers into a plasma chamber equipped with a bonding

apparatus,

(iv) exposing the wafers to 100 Watt RF plasma for at least 5 seconds, said plasma selected from the group consisting of hydrogen, argon with hydrogen, NH_4 , and H/He, and

5 (v) without breaking vacuum, placing the wafer surfaces together and into contact.